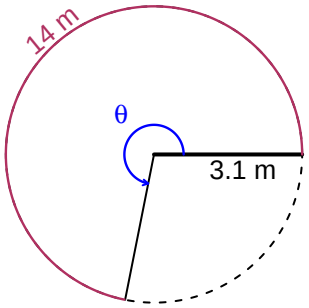
Name: Date:

Trig Final (SLTN v668)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 3.1 meters. The arc length is 14 meters. What is the angle measure in radians?

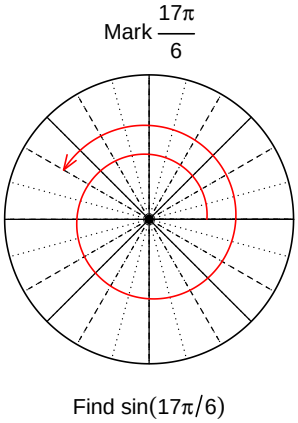


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

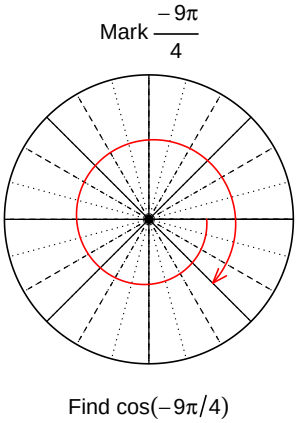
$\theta = 4.516$ radians.

Question 2

Consider angles $\frac{17\pi}{6}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{17\pi}{6}\right)$ and $\cos\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(17\pi/6)$



Find $\cos(-9\pi/4)$

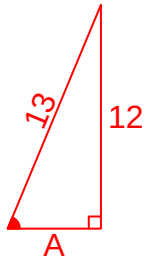
$\sin(17\pi/6) = \frac{1}{2}$

$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{12}{13}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

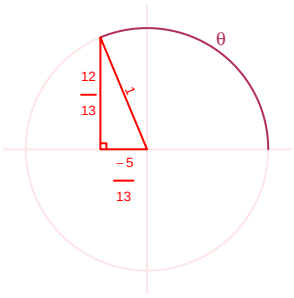
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 12^2 = 13^2$$
$$A = \sqrt{13^2 - 12^2}$$
$$A = 5$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{12}{13}}{\frac{-5}{13}} = \frac{-12}{5}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.21 meters, a frequency of 2.59 Hz, and a midline at $y = -7.5$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.21\sin(2\pi 2.59t) - 7.5$$

or

$$y = -5.21\sin(5.18\pi t) - 7.5$$

or

$$y = -5.21\sin(16.27t) - 7.5$$